SUBJECT INDEX

Abrikosov state 178–179,211,274,298
Ag–Cu–Ba–Ca–Cu–O system 258
Al_2O_3 127

Ba–(Bi–Pb)–O system 367
Ba–K–Bi–O system 250,367
Ba–Pb–Bi–O system 250
Bean–Livingstone barrier 189,225–237
Bethe's theory 277
Bi(Pb)–Sr–Ca–Cu–O system 254
Brownian surfaces 449
Butterfly magnetisation hysteresis 265

Carbon–carbon composites 9
Ceramic matrix composites (CMCs) 8,15
  applications of 125
  particulate CMCs, toughening of 92–99
    crack deflection 95
    crack front bowing 92–99
    dimensional change 111
    models of damage 108–114
      progressive debonding model 118
  particulate bridging 95–96
    thermal residual stresses 96
    transformation toughening 97–99
      model of 98
Chemical vapour deposition (CVD) 10,125
Chemical vapour infiltration (CVI) 14
COMPOCASTING 10
Composite strengthening mechanisms 15
  dislocation density 46–50
  Eshelby's model 16–21,104
  numerical models 27–35
  properties of 147
  rule of mixtures (ROM) 20
  shear lag model 20,104
  strengthening theories of 15
  subgrains 50
Compression fatigue 73–74
Continuous filaments 7
Continuous intermetallic matrix composites (CIMCs) 146–149
Continuous metal matrix composites (CMMCs) 7, 15,45
Crack growth rate 63–72
  region I 63–69
  region II 69–72
  region III 72
Crack bridging 79–83
Crack opening displacement (COD) 68
Crack trapping 69
Creep
  Coble 133
  during thermal cycling 118–125
    models of 120–125
  mechanisms of 126,133–137
  Nabarro–Herring 133
  of CMCs 125–140
  of MMCs 103–105
Critical current (J_c) 329–345
Critical field (H_c) 166,168,201–202

Debye–Waller factor 378,384
DIMOX process 13–14
Discontinuous intermetallic matrix composites (DIMCs) 141
Discontinuous metal matrix composites (DMMCs) 5,7,36
  finite element analysis of (FEM) 27
  properties of 141–145
  strengthening theories of 15
Dislocation punching 37–44

Fatigue of MMCs 61–91
of CMMCs 74–91
interface effects 89
matrix effects 83–88
of DMMCs 62–74
Fatigue cracks in CMMCs 76–79
Fiber reinforced CMCs fracture of 99
Filament effects in fatigue 86–89
Filament failure 81–82
Filament matrix strength 77,80,88
Flux creep
conventional superconductors 191–192
HTSCs 196,228,238–241
irradiation effects 281
Flux flow
conventional superconductors 191–192
HTSCs 241
Flux jumps
conventional superconductors 193
HTSCs 245
Flux lattice lines (FLL) 200,206,215,334,342, 344–345
Flux pinning 184,329,355–356
conventional superconductors 187–189
models of 185–187
HTSCs 219
chemical pinning 292–298
collective 224
grain boundaries 273
intrinsic 221
irradiation effects 276
pinning force 227
pinning potential 229
surface pinning 225,297
pinning sites 333–338
cracks 274,337
dislocations 268,337
inclusions 292,338
stacking faults 270,334
twin planes 333
pinning interactions 330–332
Flux quantization 173
Flux trapping 355
Flux vortices 184
Fluxoid 189,330–331,333,338,342
Fluxons 184,191
Fractals
self affine 427–428,451
self similar 427–428
Fractal analysis 426,429–430
direct surface area method 434
pair correlation 429–431,464
profile length 429
return probability histogram 431,465
roughness exponent 461,470
scale invariance parameters 453–454,470
slit island method (SIM) 431
Fractal geometry 425
Fractography 425
of brittle materials 438–445
of ductile materials 445–453
Fracture surfaces 438–463
brittle 438–445
ductile 445–463
fractal nature of 435–437
mirror region 437,470
"mist and hackle" 437
STM of 454–470
Fracture toughness of DMMCs 52
matrix effect 60–61
mechanism 52–56
reinforcement fracture 56–66
void nucleation and growth
Frenkel pairs 278

H–T phase diagrams 208
Hg–Ba–Ca–Cu–O system 257

Intense pulsed neutron source (IPNS) 396–397
Interfacial debonding 22

Josephson effects 180,196

Kosterlitz–Thouless phase transitions 213–214

La–(Ba,Sr)–Cu–O system 252,364,403
Lattice anomalies near T_c 392
dynamics of 401
electron lattice interactions 416–418
lattice anharmonicity 409
magnetic effects 410
resonating valence bond (RVB) model 411,418
size of 400
spin fluctuation theory 411

spin bag model 410
two component model 412–416
Lattice polarons 409
Lattice structure deviations 377
crystallographic analysis 389–392
extended X-ray absorption fine structure (EXAFS) 382,394
pulsed neutron PDF analysis 384–388
Lindeman criterion 215
Liquid metal infiltration 9
Local lattice structure 407
Lorentz microscopy 217

Magnetic diffusion 231
Magnetisation current 237
Matrix cracking 22
Meissner effect 162,165–166,181,345
Melt powder melt growth process (MPMG) 245,292,316–325
modified MPMG 325,336,347,355
Melt textured growth process (MTG) 313,320,333
modified MTG 315–318
Mendelssohn sponge model 163

Nd–Ce–Cu–O system 365
Neutron scattering 394–398
Nominal valency 368–369
Copper 370
Oxygen 371

Oxygen controlled melt growth process (OCMG) 328–329
Oxygen stoichiometry 259

Pair distribution function (PDF) 383
Pair tunnelling 181
Particulate composites 10,12
Phonon dispersion 372
Physical vapour deposition (PVD) 10
Pinning force 190
Plasma spraying 9
Point defect pinning 267
Powder melting process (PMP) 320–321
Powder cloth technique 10
PRIMEX process 11
Prismatic punching model 37–40

Quench and melt growth process (QMG) 316–325

RE123 systems 345,355–356
Resistive transition 195
Ambegoakar–Halperin model 196
critical current density (J_c) 195,223
flux creep 196
Richardson plot 429,450,451
Rocksalt 366

Shakedown state 84–87
Short fiber composites 7,10–11
Si_3N_4 128
SILCOMP process 13
Squeeze casting 10
Stress life fatigue 72–73
Structural anomalies 392
Structural modulation 373
Structural phase transitions 402
high temperature tetragonal (HTT) 403
low temperature tetragonal (LTT) 405
Superconductors
applications of 350–355
bearings 352–355
lunar telescope 350
transport systems 351–352
conventional 361
high temperature superconductors (HTSC) 361,362–363
crystal structures 260–261,362
melt processing of 313–329
grain growth in 323–324
Pt additions 322–325
texturing of 313–316
Superconductivity 162,165–166
Anderson–Kim model 163,186,191
Bardeen–Cooper–Schrieffer (BCS) 162,180
weak coupling 374
Bean's model 163,185–187,192
conventional theories of 165–177
Ginzburg–Landau (GL) model 162,173,175–177
anisotropy effects 200
London's model 162,170–172
anisotropy effects 200
Pippard's model 172–173
Type I 166–168
Type II 167–169,178,181

Superplasticity 119

Thermal cycling 106
Thermally activated flux flow (TAFF) model 241
Thermal residual stress 21,27,30,33
  analytical models of 21–22
    effect of fibers 114–115
numerical models of 33–35
Tl(Pb)–Ba–Ca–Cu–O system 256
Tuyn's law 166–167

Vortex
  interactions 174,211
  lattices 203,213–215
  single vortex 174

Y–Ba–Cu–O system 253,314-315,364